37th Topical Meeting

of the International Society of Electrochemistry

9 - 12 June 2024
Stresa, Italy

Electrochemical energy for a greener and more sustainable future society

PROGRAM

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Program of the

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Organized by:

Division 3 - Electrochemical Energy Conversion and Storage

Division 4 - Electrochemical Materials Science

ISE Region Italy

Toward Enhanced Performance: Flexible Carbon Fiber Electrode for Aqueous Organic Redox Flow Batteries

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The structural characteristics of carbon materials significantly impact the electrochemical behavior of quinones,[1] essential components in aqueous organic redox flow batteries (AORFBs). One limitation of AORFB technology arises from the chemical and electrochemical instability of electrodes, causing rapid degradation over multiple charge-discharge cycles and limiting their long-term viability. In this study, we investigated the conventional SGL 39AA (carbon paper electrode) and introduced a novel flexible carbon fiber electrode, termed the Delpho electrode, for AORFB applications. Comparative analyses revealed that the Delpho electrode exhibits superior electrical conductivity, enhanced power density, and increased mechanical robustness compared to the SGL 39AA counterpart. Characterization techniques, such as Raman spectroscopy and X-ray photoelectron spectroscopy (XPS), confirmed the functionalization of the Delpho electrode, evidenced by shifts in Raman bands and changes in the oxygen-to-carbon atomic ratio, indicating incorporation of organic groups. Scanning electron microscopy (SEM) imaging further validated the structural and chemical properties of the electrode surfaces. Notably, the Delpho electrode demonstrated higher power densities than the SGL 39AA electrode, highlighting its potential as a promising candidate for AORFB applications, offering improved durability and efficiency over extended charge-discharge cycles.

REFERENCE

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